

A 28-VOLT POWER SUPPLY FOR USE WITH AN HF LINEAR AMPLIFIER

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THIS REGULATED POWER supply is designed to give good regulation over a wide range of load currents such as powering a 300W PEP output SSB linear amplifier and surviving accidental overloads. Good regulation is essential to prevent distortion in such an amplifier. Other factors taken into account in this design are controlled dissipation by all components to reduce the energy wasted at both low and high load currents. Component types used were chosen for their characteristics and reliability.

This power supply can be broken up into logical blocks: power transformer, rectifier and filter capacitors.

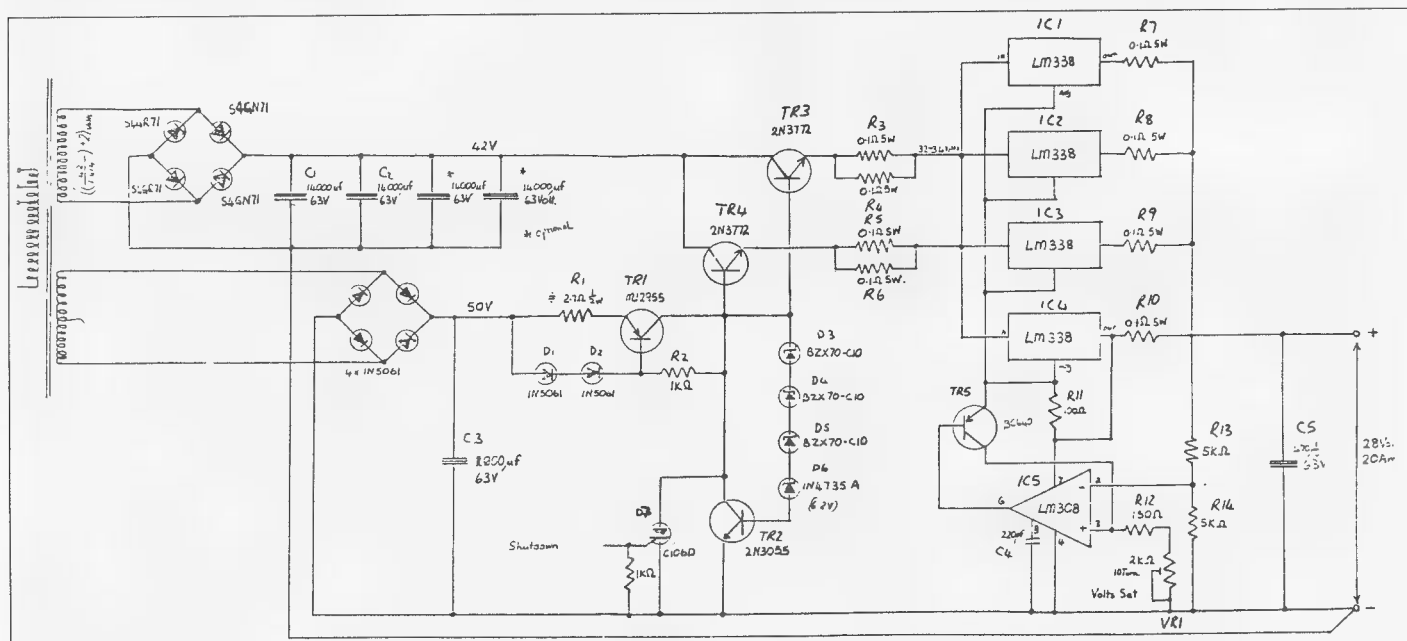
The power transformer should be rated

at about 1kW. The secondary voltage of the main winding should be $(42/1.414 + 2) = 32$ volts RMS. The auxiliary supply is derived from a 37V winding (this can be a separate transformer).

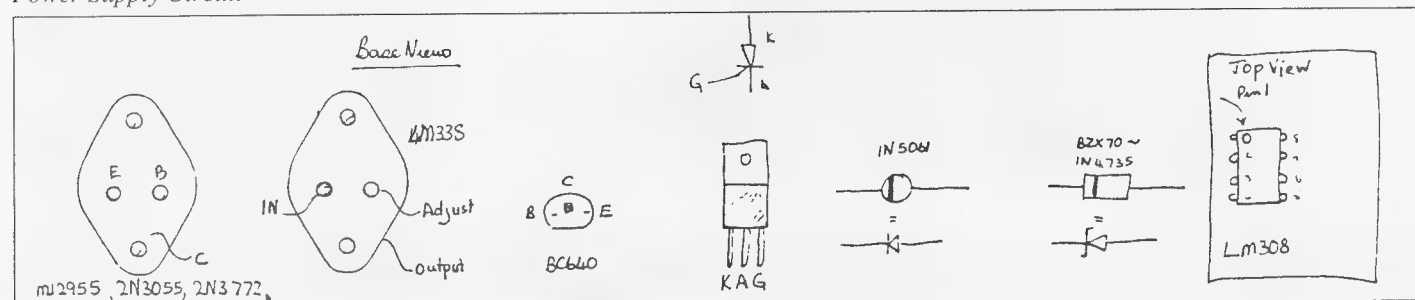
The main rectifier is a bridge configuration consisting of stud mount diodes (400V PIV 40 amp) mounted on two 76mm lengths of Philips 35D heatsink. The diodes should be complementary pairs mounting the normal pair on one heatsink and the reverse pair on the other. The heatsinks must be mounted vertically, insulated from one another and earth on, say, Dick Smith insulated spacers (H-1842) and mounted inside the power supply case. One heatsink is the positive rectifier output and the other is nega-

tive. You may think this is excessive heatsinking, but 20 watts is being dissipated on each heatsink at full load current. Bridge rectifier assemblies such as the four-terminal PB40 are unsuitable, as they can't dissipate the power efficiently and usually fail. Current flowing from the rectifier is $I_{load} + I_{filter\ capacitors}$.

The main filter capacitors used are low ESR types with high ripple current rating. By using capacitors with low equivalent series resistance, the voltage change across the capacitors is minimised between light load and full load. This reduces the power dissipated by the series pass devices. The type used was Philips 222 106 38153.



Power Supply Circuit



Semi-conductor connections

Wiring technique and component placement are important around this area. A minimum of 4sq mm hook-up wire should be used, and wire lengths should be kept as short as practicable. Capacitors should be mounted near the rectifier but not so close as to heat them from the power dissipated in the rectifier. Wiring should go from the transformer to the rectifier, from the rectifier to the filter capacitors and then from the filter capacitors to the regulator components.

Incorrect wiring technique will result in the equivalent of higher ESR which defeats our object.

The auxiliary winding voltage is rectified by a bridge rectifier and filtered by a capacitor. The drain on this auxiliary supply is approximately 100mA continuous.

Series Pass Pre-Regulator

This pre-regulator has its output voltage set by a zener diode network connected to the series pass transistors. This "zener diode" consists of D3, D4, D5, D6 and TR2 connected as a power zener. Power dissipated by this "zener" occurs when power output current is minimum. The current source consists of R1, R2, D1, D2 and TR1. The voltage drop across R1 is held constant by the voltage across D1

and D2 and the beta of TR1 thus forming a current source. TR1 and TR2 are mounted on a 76mm length of Philips 35D heatsink, but insulated from it. The series pass transistors TR3 and TR4 are high gain at high-current, high-voltage transistors. Using these transistors reduces the base current required to allow high collector currents to pass. Load current sharing between TR3 and TR4 is achieved by using R3, R4, R5 and R6. The output regulation of this pre-regulator is about two volts. Heatsinking of TR3 and TR4 is discussed later.

Series Pass Regulator

Final output voltage comes from four LM338 IC adjustable voltage regulators connected in parallel. The output of each regulator has a current sharing resistor which forces even sharing of the load current. The disadvantage of these resistors is that the voltage drop across them ruins output regulation. This is overcome by using an LM308 Op Amp (IC5) to monitor the output voltage and feed a modified control voltage to the adjustable voltage regulator's "adjust" pin via transistor TR5. Output current is limited by the input to output voltage differential across the regulators. Two 200mm lengths of Philips 55D heatsink are used

to mount all the series elements. TR3, IC1 and IC2 on one piece and TR4, IC3 and IC4 on the other. These heatsinks must be mounted vertically on the outside of the power supply case.

General Construction Requirements

All TO3 devices mounted on heatsinks need to be insulated from them using high-quality mica insulator washers with copious quantities of thermal paste applied.

Power diode mounting requires only thermal paste since these are mounted on insulated standoffs. All TO3 devices should have TO3 transistor insulator caps fitted to remove any voltage hazards. All components in the high current areas are mounted on the back of associated heatsink using tag-strip terminations. The negative output lead is connected to the negative output terminal directly from the filter capacitors. The positive lead is connected to the positive output terminal and R7, R8, R9 and R10 by short as possible lengths of 4sq mm wire. R13 is connected to the positive output terminal. C5 is connected across the output terminals. For all other wiring use 0.5sq mm insulated wire. **ar**